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THE GRAPE-VINE BORER:

IN

A COMMUNICATION ON THE GRAPE-VINE,

BY DR. E. MITCHELL,

IN THE RALEIGH REGISTER FOR APRIL 5, 1854.

My friend Dr. Francis J. Kron, of Stanly county, coming to attend the annual commencement at the University in June last, brought with him a bottle of worms and bugs, which he supposed to furnish the means of determining the cause of the ill success of such attempts as have hitherto been made to cultivate the European grape in the United States. It is well known that the peach tree is greatly injured, and frequently destroyed, by a small worm that establishes himself about the crown of the root, or just below the surface of the soil, and preying upon the soft inner bark, at length breaks up the communication between the root and leaves, so that the tree dies. The insect into which the worm is finally transformed has been named *Ægeria Exitiosa*, the latter or specific part of the name, of course, having reference to the mischief he produces.

Dr. Kron supposed himself to have ascertained that a *similar* pest, *another species* of the genus *Ægeria*, attacks the root of the European grape when planted in America, causing the vine to become feeble, sickly, and unproductive in the first instance, and finally to perish: also, (which is even more important,) that he had a remedy. We had some years since, as a member of the Faculty at the University, a gentleman to whom all such questions might be referred. There is no Entomologist amongst us now, and the bottle having been left with me by Dr. Kron, to be disposed of as I might judge best, I could think of nothing better to be done with it, than to send it to the gentleman at Cambridge by whom the report on the insects injurious to vegetation in Massachusetts was drawn up, Dr. Thaddeus W. Harris, formerly Lecturer on Natural History, and at present Librarian at Harvard.

Along with the *new* *Ægeria*, as Dr. Kron judged it, and as it proves in fact to be,—in its different conditions of larva, pupa and imago, or perfect insect,—there had been put into the bottle, *for comparison*, some specimens of the kind that infests the peach; also, a Saperda. Dr. Harris, finding these old acquaintances of his, pronounced too hastily upon the whole contents of the bottle—that it contained nothing new; but his attention having been called to it a second time, he found, on a re-examination, a new *Ægeria*.

These details will shew that Dr. Kron has not offered his views for publication, without having first availed himself of every means at his command to assure himself of their correctness. Both of the following papers appear to me to be excellent in this kind. Dr. Harris made the best possible use of the materials with which he was furnished, and the investigations of Dr. Kron are a model of that caution, keen and accurate observation, and intelligent inference from the facts observed, which such inquiries demand. Cer-

tain statements corroborative of his views will be found subjoined to the paper of Dr. Harris. The paper of Dr. Kron having been drawn up in December last, one or two expressions in it are out of date, but it has been thought best to let them stand.

STANLY COUNTY, N. C.

To all Cultivators of the Grape-Vine in the South:

Search the roots of your grape-vines (between now and spring is the best time in the South to do it,) for should you find the roots of your vines infested with a *grub-like* insect, resort, in the spring, to grafting on the *wild muscadine*, white or black, as the only means of ensuring success in the cultivation of the grape among us.

There is an insect which, in the *larva* state, very much like a grub, feeds on the roots of all the varieties of grape so far cultivated in this country, those of native origin as well as those introduced from foreign countries; none being spared except the *scuppernong*, or muscadine, white or black. That the insect has been seen by others heretofore, there can be no doubt, though nothing satisfactory has, as yet, been published in relation to the same.

The grub in question, of a dusky white, often over an inch in length, and of the thickness of a goose-quill, may be found at any time of the year, along the whole course of a root however long; and the *wasp-like* butterfly of which the grub constitutes the *larva*, or one stage of its existence, multiplies so fast that, where once found, the utter extermination of all cultivated grape-vines, in spite of every effort to preserve them, will sooner or later be their fate, unless averted by grafting on the only variety of grape, *our muscadine*, the immunity of which from the attack of the insect is well ascertained. To be sure, if an unrelenting war be waged against the insect, when it has assumed the shape of a butterfly, from June to September, so as to prevent or diminish the laying of the eggs, much may be done towards saving the vines and the crop; but such a course, exceedingly laborious where it can be pursued, as in isolated situations, would be ineffectual in a town or a neighborhood where the chase was not universally carried on. And moreover, in almost all situations, there is a chance for a plentiful supply from the vines in the woods. As for pursuing the insect in its grub state, that is out of the question; for nothing less than pulling up all the vines, with all their roots, and throwing them in the fire, could be at all relied on.

The earnest attention of all lovers of the grape, whether for wine or for the table, is therefore demanded to point out this their common and truly chief enemy. From results obtained there can be no doubt that the vine grub is the main cause of the failure of all attempts heretofore made to produce the grape among us on any extended scale. For many years trials have been made, from Virginia to Alabama, to introduce that species of culture as much for its own peculiar inducements as in order to free us from dependence on foreign supply. Everything indeed seemed to invite to such efforts; the soil, the climate, the configuration of the country, the prosperous growth of native vines in places about, the partial success in isolated spots, or with single vines; all, in a word, did urge us on to make a beginning in what proved so profitable in other countries. Yet, in spite of the length of time since the trials were commenced, not a spot in the Southern States can be pointed out where disappointment has not checked the further prosecution of grape planting. We hear of failures in every direction, and almost every imaginable cause but the true one has been assigned for the miscarriage; the soil has

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been charged with wanting the proper elements, the climate with being too inconstant, the mode of culture as being erroneous: one was said to prune too much, another not to prune enough; no body looked at the roots where the destroyers were at work underground whilst experimenters were speculating on causes, all on the surface. The failure, particularly with the finer sorts of foreign grapes, has been so general that of late the importation of plants of foreign grapes has been a dead loss to adventurers; nobody being found willing to purchase. An idea has even gained ground that we must resort to our woods and be resigned to cultivate native varieties, be they as they may. Hence some have confined themselves to the *Catawba Grape*, certainly a native; others to the *Isabella*, supposed by some to have originated in North Carolina; but neither sort, any more than the foreign grapes, is secure from the depredator. The *Isabella* seems particularly a dainty bit for the grub. The only exception is the Scuppernong; all other grapes, sweet or sour, of spongy or compact wood, of woody or soft inner bark, are certainly destroyed, though those of spongy wood and soft inner bark greatly in preference.

Will the writer be pardoned for introducing *his experience* which led to the facts now published? The same ardent wish now prompting him to this communication, namely to reproduce among us the choice varieties of the grape, which in their perfection are among the finest gifts of Providence, had induced him many years ago to attempt, with his own hands, the cultivation of those sorts which he had seen so abundant and so fine from the banks of the Rhine to the shores of the Mediterranean, from the region where the peach will not ripen to where the orange matures in open fields, on soils to which ours are at least equal and in climates of which we in the South possess the parallel, with rather a higher temperature on our side to mature the choicest sorts, unaided by walls or artificial heat. The failure of others did not dissuade him from making the attempt. He flattered himself that by practising upon what he had seen done abroad he might succeed where others had failed. And truly, at first, the success was so complete, the wood and the fruit of many foreign sorts ripened so satisfactorily under his management, that, in the joy of the result, he was inclined to think he had found the way to manage the thing, and that all really depended on the mode of training. But the joy was not long lived. The most flourishing vines one after another became drooping, the foliage seemed sickly, the wood did not ripen sufficiently for another crop, the fruit, though setting well, would rot or blight on the canes, and the vines themselves successively die. Still, as the vines had done so well at first, neither soil nor climate could be charged with the disaster. Charging therefore the mode of culture, *short pruning*, with the agency of the mischief, the recommendations of those who asserted that the vines on this side of the ocean required free scope in their growth was now acted on; all new younger growths were allowed to extend almost at pleasure. The first years they did *nearly* as well as those which had been vigorously pruned, and the *free scope plan* seemed to be the true plan for us. But, alas! disaster came as before, and the last method proved no better than the first. The pursuit was about to be given up, when accident shed on the previous failure a light, which has made stronger than ever the writer's confidence that the grape in all its varieties may be produced among us as perfect as in the most favorable climates.

On pulling up, in the spring of 1850, a vine, the foliage of which was withering, the roots were found as if gnawed off. On further search they were seen to be hollowed out and reduced to a mere shell of bark filled with

the fresh gnawings of an insect. The latter was now sought for and specimens enough of an ugly whitish grub were soon found from the extremities to the very origin of the roots at the trunk of the vine. The grub, though much larger and whiter than the larva of the insect which annoys the peach tree, yet resembles it so much, that at first it was thought to be the same, somewhat modified by the plant it fed on. On extending the search, other vines were found infested, and the more as they were more drooping and perishing. The conclusion was now unavoidable, that this same grub had been killing the vines, and that neither soil, climate, nor mode of training had any agency in the mischief. To solve the question whether this was a mere modified larva of the peach insect or of an insect altogether different, numbers of apparently full grown larva were put in a glass jar along with cocoons that were found ready formed in the roots; and behold, the naked larva formed gluey cases for themselves in the jar, and after a while, in July, out of the cocoons taken from the roots, and out of the cases formed in the jar, there issued alike, not the peach insect, but a yellowish brown butterfly, so much like a wasp, that seen under other circumstances, one would have been afraid to touch it.

Having thus come in possession of the final shape of the insect, a few minutes' ramble among the vines sufficed to identify numbers of specimens on the wing and at rest, but mostly disporting among the leaves or as if in quest of something, none of them feeding on anything whatever. Thenceforward daily observation led to nearly a full knowledge of the history of the insect. From 8 A. M., to 4 P. M., is the only time they can be seen on the wing. The greatest number appear at about 1 P. M. Their season is from the middle of June to the middle of September. Their whole object in the butterfly state is the perpetuation of the species. The males are smaller than the females and greatly more numerous. They seem to have special rendezvous to which the males always resort first, and wherever the males resort a female may be expected; they seem almost to know beforehand where a female is to appear above ground; indeed merely touching a female is enough to cause the males to settle on one's hand. The insect is readily caught, particularly the females when just evolved from their pod; they are then too heavy for flight; as many as 400 eggs have been taken from one of them. The eggs are laid anywhere, on anything on the surface of the ground, and at any distance from the trunk of the vine, though oftener near to the trunk. Later in the season the young grubs can be detected along the small roots, gnawing their way under the bark towards the trunk, which, by evolving time, is pretty well shorn of all its roots, large and small, and if new roots have not pushed out above the infested ones to keep the vines alive for another season, the plant must die the same year.

An insect so disseminated over the whole area in which the vine grows is of course not to be destroyed by anything you apply merely to the trunk of the vine; it would indeed require application over the whole surface of the ground. But what can that be which so applied would prove fatal to the insect? Not lime or potash even in their caustic state, for the bark, under which the grubs advance protected, shields them from the action of the caustic, and in fact, vines have been killed with the lime and the potash when the grub escaped unhurt by either.

With the exception of the Scuppernong, every variety of grape cultivated—and the writer cultivates many sorts, though but few plants of any—was found infested with the grub. At first the insect could not be detected in

the vines in the woods, but since it has been found even in vines such as the *winter grape*, which, on account of their compact wood, close thin bark, and harsh juices, would have seemed most likely to be spared. The thrift of the Scuppernong in the midst of such universal decay was so remarkable, that at one time it was suspected of being the cause of its neighbors' languor; some Chasselas and Miller's Burgundy seemed starved to death. On taking up the Scuppernong after the discovery of the grub, not a fibre was found injured,—its legion of all invading roots, interwoven with the roots of other vines dying from the insect and not from the vicinity of the Scuppernong, were found untouched.

The hint was plain; if the Scuppernong could serve as a stalk to graft the other sorts upon, the insect would be foiled, the remedy would be discovered along with the evil, and we might yet expect to see in America, growing at the cottage door as well as on the rich man's arbor, those splendid clusters of grapes, the very sight of which, in Europe, commands admiration. The trial made on a wild muscadine resulted in all that could be desired; fifteen months after the graft was inserted, ripe Chasselas of Fontainebleau grape, the berries of which, though not the clusters, would not have been disowned at Thomery, were gathered from a vine the root of which is a native Carolina muscadine, grafted a few inches above the ground. So not only did the graft stick and grow the first year, but bore perfect fruit the next year, and is firmly united now, exhibiting above the characters of the Chasselas and below those of the muscadine. From that time every variety cultivated by the writer has been grafted successfully on our wild Scuppernong; the Herbe-mont and wine grape not less readily than the fine Chasselas and Muscat for the table.

A doubt may still occur to some as to the diffusion of the insect; some may think it confined to this locality, on the Yadkin near the mouth of Uwharee, among the hills of Stanly and Montgomery. But on referring them to the Patent Office Rep., *Agriculture*, for 1850-'51, page 448, they will there find W. L. Morton, Esq., from Cumberland county, Virginia, stating that "vines should be transplanted the 2d year, as large ones become *wormy* and die," and moreover that all his foreign vines died in a few years in spite of all care. It will be seen also by the subjoined note of Dr. Harris, that in 1830 the same insect here introduced to notice was seen in Georgia and figured by Mr. Abbot. So there can, unfortunately, be no doubt as to the diffusion of this plague in the Southern States.

However, the writer solicits inquiry: let the evil be ascertained, and if present, the remedies are at hand: 1st, kill the female insect before they lay their eggs; but 2d and best, graft on wild muscadine from February to April, by common cleft grafting, a few inches above the ground, with cuttings saved in a cold, shaded place till that time. Care must be taken not to let the cutting above the point of union strike root, or the muscadine send forth canes, which would defeat the object of the grafting. By waging a war of extermination against the insect, killing both males and females as long as the season lasts, from the middle of June to the middle of September, the result will be a revival of drooping vines, the ripening of the wood for ensuing crops, and the regular growth and maturation of the fruit. Such result has been obtained even after *one* season of persevering chase. Fruit has again been obtained which had failed to come to perfection during an interval of many years. White Muscat and Black Hamburg have shown again what they can be among us when the grub is not at work, and have fully

vindicated North Carolina soil and climate and mode of cultivation from all manner of reproach. But such perseverance must not be omitted for one season, as such omission would be certain to renew the evil. Hence grafting on the muscadine is the better plan; by it the insect is baffled, the vine saved, and a world of trouble avoided.

It seems that the *vine grub* is a plague of our own. Careful inquiry has failed to discover any mention of anything like it in Europe, as the mere fact of the flourishing vineyards in that part of the world might naturally have led to expect. It is a plague which can be easily transmitted by sending large rooted vines abroad, and which ought therefore to be carefully avoided; nothing but cuttings ought to be sent or received. F. J. KRON.

CAMBRIDGE, MASS., Nov'r 21, 1853.

Note upon the insects injurious to the roots of the cultivated grape-vine in North Carolina: By Thaddeus W. Harris.

It is well known that the peach tree suffers much from the attacks of an insect that burrows under the bark of the roots and bark of the trunk. Another insect allied to this is very destructive to the best kinds of pumpkin and squash vines, by boring through their roots. In like manner, the roots of cultivated grape-vines in some of the Southern States are found to be much injured by similar insects, which prevent the ripening of the fruit, and finally cause the decay and death of the vines. The insects above referred to, though not absolutely identical, have many points of resemblance in all their stages, and in their habits and transformations. They are different species of one and the same genus, called *Ægeria* by naturalists of England and America, and *Sesia* by those of France and Germany. The peach tree insect has been described and figured in the second volume of Mr. Say's American Entomology, under the name of *Ægeria Exitiosa*. The species that infests the roots of the pumpkin and squash is called *Ægeria Cucurbitæ*, and was first described in the New England Farmer for Aug. 22, 1828. This *Ægeria* of the grape-vine does not appear to have been described; but there is a rude figure of it in its adult or winged form, in an unpublished collection of drawings made by the late venerable John Abbot of Georgia, in the year 1830, and now in the possession of the writer of this note.

To Dr. F. J. Kron, of Albemarle, North Carolina, who has paid much attention to the cultivation of the grape-vine, we are indebted for a complete discovery of the history and transformations of the destructive insect that infests the roots of the most valuable varieties of this vine, and for the means of arresting its depredations. He has favored the writer with samples of the injured roots, and with numerous specimens of the insects in all their forms, accompanied by a request for a scientific name, and a description of the species,—which are herewith furnished:

The *Ægerians* appear under three different forms. The first is that of the *larva*, which is the form and condition of the insect when it is hatched from the egg, and during the whole of its growing state. The *Ægerian larva*, sometimes improperly called a worm, is a whitish, plump and grub-like creature, provided with horny jaws, and with sixteen extremely short feet. It is while it remains in its larva or grub-like state that the insect does all its mischief. Being at this time very voracious, it increases rapidly in size, and comes to its full growth in less than a year, and many species in the course of a few months. At the end of its growing state, the larva encloses its body in an oblong oval pod or cocoon, formed of fragments of bark or of wood, or

particles of earth, cemented by a small quantity of viscid matter. In the course of a few days, while still lodged within its cocoon, it casts off its larva skin, and appears in its second or *chrysalis* form. The *chrysalis* is much shorter than the larva; it is of a shining brown or mahogany color, and spindle shaped, and blunt at one end, and abruptly tapering at the other; its limbs are immovably soldered to its breast; the rings of its hind body are surrounded with transverse rows of minute teeth, and the tail is also generally beset with a few larger teeth or short spines. When the time approaches for the last transformation of the insect, which commonly occurs in the spring or in the early part of summer, the *chrysalis* breaks a hole through one end of its cocoon, and, by the help of the transverse rows of teeth and the spines of its tail, it forces its body half way through the opening of the cocoon. Immediately after it has so far liberated itself, the skin of the fore-part of its body splits open, and from the fissure there issues a six-legged wasp-like creature, provided with four narrow and flabby wings, which soon dry and become fitted for flight when the insect has made its way to the light and air. The winged *Ægerians* fly only during the day, at which time also they seek and couple with their mates. The males delight to bask and spread their tufted or fan-like tails in the warm sunshine, during which also the females may be discovered laying their eggs. The foregoing short and general account of the transformations of the *Ægerians* will prepare the reader to understand the more particular description that follows:

The grape-vine *Ægeria*, in its winged or adult form, might, at first sight, be mistaken for the brown wasp of the South, called *Vespa (Polistes) nigrapennis*, by De Gur, being somewhat like the common insect in form, size and color. Upon examination, however, it will be found to belong to a different order, having a spirally rolled tongue instead of jaws, mealy scales upon its body instead of a naked horny skin, and a tuft at the end of its tail, instead of a sting. Its resemblance to this wasp suggests for this species the name of *Ægeria Polistæformis*, or the *Polistes*-shaped *Ægeria*. There is sometimes a striking disparity in the size, color and markings of the sexes of the *Ægerians*. This is particularly observable in the species that comes from the peach tree, the males and females of which differ so much from each other as to have been mistaken for different species. Although the two sexes of the grape-vine *Ægeria* do not differ so greatly from each other, there is much disparity in the size, and some variation in their color. The specimens sent by Dr. Kron have been somewhat injured, and hence the following description may not correspond exactly to fresh and uninjured specimens:

The body of this *Ægeria* is of a brownish color, more or less tinged with tawny orange on the back and sides of the female. The thorax and two of the wings of the hind body are edged with yellow. The neck and shoulder covers of the male are tawny orange or saffron colored, as are also the feelers or *palpi*, the tip, base, and lower side of the antennæ, and the legs, in both sexes; the middle of the upper side of the antennæ, and the lower side of the thighs and of the shanks are of the steel blue. The fore wings are dusky and opaque; the hind wings are transparent, with black veins, margins, and fringes. In both sexes there is a short tawny tuft on each side of the tail; besides which the male has two intermediate, longer, yellowish tufts, or pencils of hair.

The body of the male is from five to six-tenths of an inch long, and his wings expand from one inch to one inch and three-twentieths.

The body of the female varies from six to nine-tenths of an inch or more in length, and her wings expand from one inch to one inch and a half.

Considerable difference will probably be found in the dimensions of the insect in its previous forms. The larva or grubs submitted to my examination were from one inch and one-quarter to one inch and three-quarters in length; and the *chrysalis* from three-quarters of an inch to rather more than one inch in length.

The late Dr. Caldwell after traversing that part of France where the finest vines are produced, and passing down the Rhine, was desirous of seeing the cultivation of the grape introduced into North Carolina, and undertook to make himself the necessary experimental trials. He procured from M. Parmentier, of Brooklyn, Long Island, rooted vines of choice varieties, that had been imported from France, to the amount of between one and two hundred dollars, and had them planted according to directions with which he was furnished. His vineyard received the most careful attention, and the results of the first year were of the fairest promise. The vines took

on a rapid growth—some attained a height of ten, corresponding size or diameter, and full of health and vigor. At the close of the first summer, Dr. Caldwell had the highest anticipations of complete success. A paper of his, giving an account of what he had done, and what the prospect was, at the time, may be found in the Register of that day. The experience of the second year did not correspond to that of the first. Some grapes of rather indifferent quality were obtained, but the vines did not flourish as in the preceding summer. The whole proved in the end a total failure, and the stock of vines procured by him has probably by this time died out altogether, or if not, they have at least been abandoned as worthless. Now, the difficulty is to account for the discrepancy between the results of the first and the succeeding years. During the first summer, there was every indication that the soil was of the right kind, and the climate genial to the varieties of grape that were under culture. Why then did they sicken and fail so soon afterwards? The suggestions of Dr. Kron seem at least to furnish a solution to the enigma. If a new species of *Ægeria*, new to naturalists, a native insect, attaches itself of preference to the European vine, and feeds upon it, it is easy to see how Dr. Caldwell's vines may have had a vigorous growth during the first summer, and have failed altogether at a later period. It was not till near the close of the first summer, or in the course of the next following, that the effects of their depredations would be seen. The insect supposed to be the cause of the mischief may be more abundant in some parts of the country than in others,—about Demopolis, in Alabama, for example, where an attempt, that was wholly unsuccessful, was made under the patronage of the General Government, to introduce the culture of the grape, by the agency of the French colonists some years since, then at Vevay, in Indiana, where emigrants from the Pays de Vaud, in Switzerland, did accomplish something.

If any one shall judge it *improbable*, that we should have in America a native insect, which after having propagated itself and lived upon some native grape for innumerable generations, at length, as soon as a foreign grape is introduced, abandons its old victims and lays hold of the new comer in such numbers and with such an appetite as utterly to destroy it, it may be said in reply, that it is but another instance of what is witnessed in the *Ægeria* of the peach, the *Curculio* of the plum, the bug (*Bruchus*) of the common garden pea, perhaps also of the cornfield pea, (though this last pea may have been borrowed from the Indians,)—all of which are natives, were unknown to Europeans on their arrival on the western shore of the Atlantic, and now seem to confine themselves, very much, if not exclusively, to trees, fruits, and seeds that were introduced from Europe.

With regard to the remaining point in Dr. Kron's paper, that the new *Ægeria*, though it seeks eagerly when in the larva, or grub state, the roots of the European vine, will avoid those of the muscadine, it is to be recollected that whilst some insects are nearly omnivorous, so far as green vegetables are concerned, others confine themselves, if not to a single plant, at least to plants amongst which there is a very intimate resemblance. The locust of the East sweeps everything before it; no green leaf of whatever kind escapes. The *Saperda* which was along with the other insects in the bottle sent to Dr. Harris, prefers greatly the hickory; whose small limbs he cuts off in great numbers, so as to strew the ground under the tree with them in the fall of the year. But if he happens to be driven off by a storm, or to wander in any way from the spot where hickories are to be found, he will make use of the persimmon, the honey locust, and, as Gov. Owen told me he had observed in his own garden, on the quince. The Muscadine departs so widely in all the characters of its growth and wood from other grapes, that there is no antecedent improbability in the idea, that a worm which eats *their* roots with avidity, may turn away, and refuse to touch those of the other.

Dr. Kron, it will have been seen, does not desire that his views shall be received and his plans adopted without due examination. But believing that he has fallen upon some facts that are both new and likely to prove valuable to his fellow-citizens, he offers them for publication, hoping that some persons, who take an interest in such things, will assist him in these investigations—so that the truth will at length be ascertained. The time may come, when the vine-clad hills of North Carolina will be spoken of as familiarly as those of France are now.

E. MITCHELL.

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